A new classification of Collembola and Protura life forms

JOSEF RUSEK

Rusek, J.: A new classification of Collembola and Protura life forms.
Contributions to Soil Zoology in Central Europe II. Tajovský, K., Schlaghamerský, J. & Pižl, V. (eds.): 109-115. ISB BC AS CR, v.v.i., České Budějovice, 2007. ISBN 978-80-86525-08-2

A new classification of Collembola and Protura life forms is proposed. Each eco-morphological life form group is morphologically and ecologically characterized, allowing Collembola to be classified into two main groups: A - atmobionts, and B - edaphobionts. Group A comprises four subgroups: a) macrophytobionts, b) microphytobionts, c) xylobionts, and d) neustons. Group B is divided into three subgroups: a) epigeonts, b) hemiedaphobionts, and c) euedaphobionts. Hemiedaphobionts comprise two subclasses according to their size and occurrence in the soil profile. Euedaphobionts are divided into three classes (large, medium, small) and six subclasses according to presence or reduction of the furca (with furca versus furca missing or reduced). Protura belong to the medium and small size subclasses of euedaphobionts. Former life form systems of Collembola are discussed. The proposed system facilitates the use of Collembola in a more comprehensive way for ecological studies. The life form community structure and its seasonal changes are derived primarily from Collembola studied in xerothermic rendzina soils in the Bohemian Karst.

Keywords: Collembola, Protura, life forms, life form community structure changes, soil fauna.

Josef Rusek, Institute of Soil Biology, Biology Centre AS CR, v.v.i., Na Sádkách 7, 370 05 České Budějovice, Czech Republic. E-mail: rusek@upb.cas.cz

Introduction

Collembola are one of the ecologically most diversified groups of arthropods. This has enabled them to colonize a wide range of different microhabitats in all terrestrial and to some extent also aquatic ecosystems. Their ecological diversification is closely connected with morphological adaptations. During their evolution, Collembola invaded soil, plants, water surfaces and a number of other special habitats. They invaded the soil environment from the surface to considerable depths. Hence, the most remarkable ecological life forms arose during colonization of the soil.

Conspicuous morphological differences among Collembola living in diverse habitats led Gisin (1943) to classify them into five groups of life forms, differing morphologically as well as ecologically:

A. *Atmobiotic* species, inhabiting higher plants, with 8+8 eyes and long antennae;

B. *Hemiedaphon*: well pigmented animals with antennae of medium length;

a) *hydrophilous*, inhabiting water surface, and with mucro bearing wide lamellae;

b) *mesophilous*, inhabiting upper soil layers, and with acuminate or knobbed tibiotarsal tenent hairs;

c) *xerophilous*, inhabiting bark of trees, lichens and mosses of dryer habitats. Body and tibiotarsi with numerous knobbed hairs;

C. *Euedaphon*, true soil animals. The number of eyes is reduced or eyes are completely missing, pigmentation is missing or limited to eyes.

Bockemüll (1956) modified Gisin's life form system. He divided the hemiedaphic group into further subgroups characterized by different degrees of reduction in eyes, furca and pigmentation. Stebajeva (1970) criticised Bockemüll's life form system as an inconsistent, unqualified mode for classifying into individual groups. She argued, for example, that species with 8+8 eyes were unreasonably included in the second subgroup of hemiedaphobionts in Bockemüll's system, and tried also to overcome other shortcomings in his system. She distinguished four main groups of collembolan life forms with 10 subgroups incorporated into four phyletic lines. She analysed the European and Mediterranean fauna from Gisin's Collembolenfauna Europas (Gisin, 1960), but was misled in her conclusions by rigidly applying quantitative characters (for instance the number of eyes). In such a mechanical system of a life form classification, she incorporated many taxa of Collembola into wrong groups, not knowing their true habitat requirements and phyletic relationships.

There are many inaccuracies in contemporary collembolan life form systems (Gisin, 1943; Bockemüll, 1956; Stebajeva, 1970) arising from inconsistently defined morphological criteria for groups and

Presented at the 8th Central European Workshop on Soil Zoology, České Budějovice, April 20-22, 2005

Table 1. Size and morphological characteristics of the proposed group, subgroups, classes and subclasses of edaphobionts and their preferred habitats in soil: The simple arrows show the direction of migration from the main habitat to the temporary ones in parenthesis. The double-faced arrows show vertical migrations through the soil horizons.

B.	EDAPHOBIONTS	Length in mm	Pigment	Eyes	Antennae	Preferred habitats in soil
Ba.	Epigeonts	0.2-5 (8)	+++	+++	long - medium	soil surface ↔ litter
Bb.	Hemiedaphobionts					(soil surface) ← litter (→upper A horiz.)
Bb1.	upper	>1	(+++)++(+)	++(+)(-)	medium	(soil surface) ← litter
Bb2.	lower	0.7-1	++(+)	+(-)	medium	litter (→upper A horiz.)
Bc.	Euedaphobionts					(litter ←) A, B, C horiz.
Bc1.	large size	>1	+/--	+/-	medium	(litter ←) A horiz.
Bc1a	with furca					
Bc1b.	furca reduced or missing					
Bc2.	medium size	0.7-1	+/--	+/--	medium-short	(litter←) A horiz. (→ B horiz.)
Bc2a.	with furca					
Bc2b.	furca reduced or missing					
Bc3.	small size	0.2-0.7	(+)--	(+)--	short	A horiz. ↔ B horiz. ↔ C horiz.
Bc3a.	with furca					
Bc3b.	furca reduced or missing					

subgroups, unfamiliarity with the species true biology and ecology, and forced effort to include morphological criteria of every life form category regardless of phyletical trends in different families. For example, the number of 8+8 eyes was probably not the same in the ancestors of individual phyletical lines of Collembola. The ancestors of Onychiuridae were probably eyeless as is documented in the dark pigmented species with a functional furca, such as *Tetrodontophora bielanensis* (Waga, 1842) and *Lophognathella choreutes* Börner, 1908. *Xenylla* and related genera possessed no more than 5+5 eyes throughout their evolution. Most *Xenylla*-species are heavily pigmented and have a well-developed furca, nevertheless none of their representatives possesses more than 5+5 eyes, but in the existing life form systems they are classified as euedaphic or hemiedaphic forms. A fundamental error in all current life form systems is the classification of many species as edaphobionts although they do not inhabit soil at all [e.g. Gisin (1943) and Bockemüll (1956) classified species living on water surface as hydrophilous hemiedaphobionts, whereas Stebajeva (1970) regarded them as hemiedaphobionts living in upper soil horizons]. Corticolous species are usually assigned to different groups of hemiedaphobionts.

The discrepancies mentioned above were the reason to produce a new Collembola life form system. It should eliminate hitherto existing misunderstandings and inaccuracies in the life form classification. The proposed system is based on field experience and collembolan microhabitat studies in xerothermic rendzina soils in the Bohemian Karst, in beech, spruce and other forests, in grasslands and alpine habitats, as well as on data from the literature (Hågvar, 1982; Kubíková and Rusek, 1976; Rusek, 1989, 2001). Morphological criteria are used in the new classification system as well, but only in connection with the phylogeny of the family (or a lower taxonomic unit).

The soil environment has a characteristic vertical stratification (horizons and sub-horizons) characterized by soil microstructure, biological, chemical and physical parameters. Collembola do not belong to animals actively burrowing tunnels in the soil. Rather, they use soil crevices, channels and tunnels of soil macrofauna to move through the soil. That is why soil porosity is one of the leading parameters determining the distribution of edaphic Collembola in the soil profile. Pore size declines with soil depth and simultaneously channel connectivity decreases, too. This phenomenon controls the occurrence and restriction of individual life forms to certain horizons or even sub-horizons of the soil profile (cf. Haarløv, 1960). In deeper soils there are but minute pores inhabited by the smallest and slim forms of euedaphic Collembola. The largest forms of euedaphobionts (with or without furca) live together with large hemiedaphobionts near the soil surface in some forest soils with a well-developed litter layer and with large pores and channels. Most species occurring on higher plants, in mosses, under the bark of logs, in rotten wood and on water surface do not belong to the edaphobiont group, and they are therefore classified here as atmobionts. Epigeonts, hemi- and euedaphobionts actually belong to the soil animal group of edaphobionts.

In some cases it is very difficult to decide to which group of life forms a certain species belongs, especially those that change microhabitats during postembryonic development. For instance, the first larval stages of some *Entomobrya*-species live in the upper soil horizons, while later they migrate from the soil to higher plants and live as atmobiotic forms (Rusek, 1964). During the course of the year, some species migrate upwards from soil and live for longer or shorter periods on the bark of trees (Kampmann, 1987). *Tetrodontophora bielanensis* lives in litter and upper soil horizons, but during rainy periods it moves to the soil surface, tree trunks and rotten stumps

where it feeds on algae and fungal hyphae; conversely, it spends dry summer periods deep in the soil and rock crevices. However such habitat changes during different seasons do not influence the classification of species with prevailing hemiedaphic morphological adaptations and hemiedaphic mode of life in humus and litter horizons into a group of atmobionts.

The smallest forms of euedaphobionts with greater morphological adaptation for life in soil inhabit deeper parts of soil as well, and are able to move up to the litter, but in contrast the larger forms of the euedaphobionts can live and penetrate less deeply into the soil because of their dependence on larger pore size (Table 1). Epigeonts (or even atmobionts) can live in upper layers of litter, and hemiedaphobionts can occur on the soil surface during favourable periods (Table 1).

The proposed life form classification of Collembola takes into consideration all the facts mentioned above. The names of some life forms were not changed for formal (nomenclatorial) reasons, but their content is different. The proposed classification is applicable to Protura and other members of the soil mesofauna, too. All forms of Protura belong to the euedaphic subgroup without furca, and class differentiation depends on their length only (because they lack a furca).

Proposed life form groups of Collembola

A. ATMOBIONTS:
   a) macrophytobionts,
   b) microphytobionts,
   c) xylobionts,
   d) neustons,
B. EDAPHOBIONTS:
   a) epigeonts,
   b) hemiedaphobionts,
      1. upper,
      2. lower,
   c) euedaphobionts,
      1. large size,
         a. with furca,
         b. with missing or reduced furca,
      2. medium size,
         a. with furca,
         b. with missing or reduced furca,
      3. small size,
         a. with furca,
         b. with missing or reduced furca.

Ecological and morphological characteristics of life form groups and subgroups

The main eco-morphological life forms of Collembola are shown in Fig. 1. The most important morphological characteristics, as their lengths, development or reduction (missing) of pigmentation and of eyes, the lengths of antennae and legs of edafobionts are given in Table 1. The behaviour of edaphobionts in the soil profile, e.g. their main habitat and the vertical migrations to temporal microhabitats are presented in Table 1. All these characteristics are important features of the individual eco-morphological life forms. They are not characterised strictly by the depth in which they live in soil, but a complex of morphological as well as ecological features has a high value, too.

A. ATMOBIONTS

Animals that live above the soil surface on plants, on/or below the bark of trees, in rotten wood, on water surface, etc. They are mostly well pigmented, with long furca, antennae and legs.

Aa. Macrophytobionts:

Species that live on leaves and other parts of higher plants. They are 0.6-3 mm (and more) long, usually with dark pigmented spots, bands and strips on yellow, green or otherwise coloured body, in some species the whole body is darkly pigmented. Antennae, legs and furca are usually long or very long. Eyes are always present in the full number of 8+8. Various members of the Symphypleona and Entomobryomorpha belong to this life form subgroup.

Ab. Microphytobionts:

Species that inhabit mosses and lichens growing on rocks, soil surface, bark of trees and logs, etc. They are usually 1-2 mm long, with characteristic pigment spots, bands and strips, or the whole body is darkly pigmented. Some species bear anal spines. Antennae and legs are well developed, but shorter than in the previous group (Aa). The furca is well developed or completely missing in some species. The number of eyes is never reduced. *Anurophorus laricis*, *Entomobrya corticalis*, etc. belong to this subgroup.

Ac. Xylobionts:

In this subgroup are species that live on/in rotting wood and below bark of dead trees. They live also in the soil of virgin forests, but only in places with a greater accumulation of rotten wood and they disappear when the wood is mechanically decomposed and transformed into microstructure components of the soil matrix (faecal pellets of soil invertebrates). They are usually 1-5 mm long (in tropical countries even more), and dorsoventrally flattened. Long setae are usually situated on tubercles of different size and surface structure (reticulated, granulated); pigmented blue or reddish, but in some forms pigment is missing. The number of eyes is reduced to 5+5 or less, and in many species eyes are completely missing. Antennae and legs are relatively short and the furca is missing. Representatives of Neanurinae belong to this subgroup.

Ad. Neustons:

Species that live on the water surface or on plants floating on it (e.g. *Lemna* spp.); 0.25 to 1.2 mm long and light or dark pigmented. The dark pigment often forms characteristic spots. Antennae and legs are usually short. The furca is well developed, very often with wide

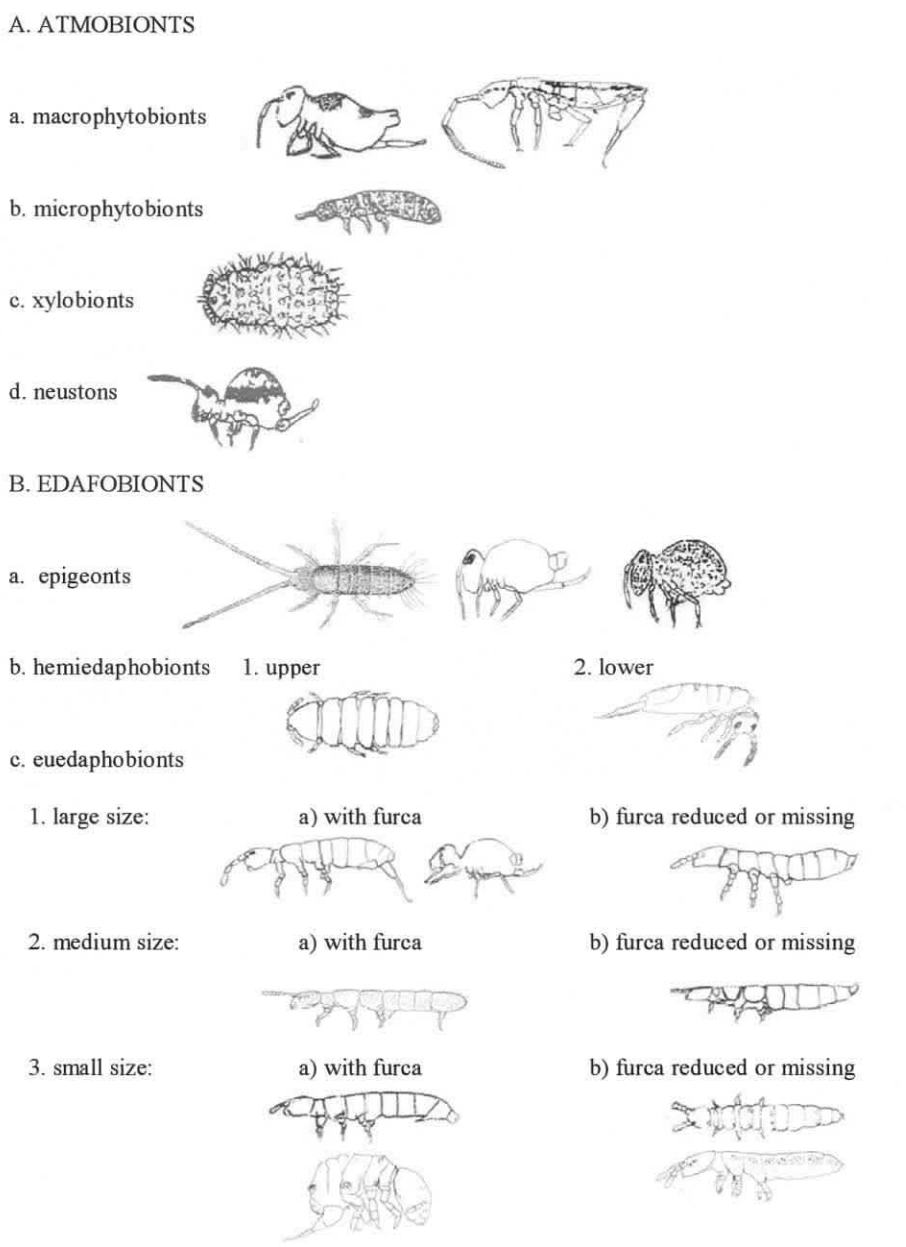

Fig. 1. Proposed Collembola life form classification.

lamellae on the mucro. 8+8 eyes are present on the head. Most representatives of *Sminthurides*, *Podura aquatica*, *Hydroisotoma schaefferi* and other forms belong to this subgroup.

B. EDAPHOBIONTS

Species that live on the soil surface, in soil or in soil-like substrates (e.g. wood in an advanced stage of decomposition); 0.25 to some mm long, pigmentation is well developed, reduced or even missing. Antennae and legs are long; medium or short, the furca is well developed, reduced or missing. The number of eyes is 8+8 or less, very often completely missing. Some species from almost all families belong to this group. According to the soil horizons in which they live, and to their morphological adaptations, this group is divided into the following subgroups, classes and subclasses:

Ba. Epigeonts:

They live on the soil surface, on stones, rocks or on wood lying on the soil surface, in the uppermost layers of plant litter, and on the surface of stumps; 0.2 mm (*Sphaeridia* spp.) to some mm long (e.g. *Orchesella* spp.,

Tomocerus spp.). Most species are uniformly dark pigmented, but some are brightly coloured with dark patterns on yellow, green, orange or other basic colour. Antennae and legs are usually long to very long, the furca in all cases is well developed. Eyes are usually present in the full number of 8+8 (6+6 in Tomoceridae and some *Desoria* spp., and 5+5 in some *Xenylla* spp.). Different representatives of Symphypleona, Entomobryomorpha and Poduromorpha belong to this subgroup.

Bb. Hemiedaphobionts:

Species of this life form subgroup live in the uppermost soil horizons (litter and upper layers of the humus horizon) and they appear very often on the soil surface. They have many morphological and ecophysiological adaptations for life in the soil, but not developed to such an extent as in the following subgroup of euedaphobionts (Bc). Hemiedaphobionts are 1-2 mm long, but even larger (e.g. *Tetrodontophora bielanensis*, *Neanura tetrophthalma*, etc.) or smaller (e.g. *Xenylla acauda*, *Xenylla boerneri*). Their pigmentation is uniformly dark or reduced to small pigment grains, and if so, the body is then lightly pigmented. The pigmentation is sometimes concentrated into larger spots. Antennae and legs are not very long, body is stout, and the furca is well developed or reduced (sometimes completely missing). Eyes are present, but their number is sometimes reduced. Some species without eyes, but with dark pigmentation and well developed furca, belong also to this subgroup (e.g. *Tetrodontophora bielanensis*). Representatives of Poduromorpha and of some genera of Entomobryomorpha are typical in this subgroup. Two subclasses were established for hemiedaphobionts. They differ not only morphologically, but also in their mode of life in litter and upper layers of the humus horizon:

Bb1. Upper hemiedaphobionts:

These live in the uppermost soil horizons especially in plant litter and in upper layers of the humus horizon (if there are enough large air spaces and channels in the soil). They are usually 1 mm and more in length, body stout, and the furca usually short (in some species missing, but in such cases the body is darkly pigmented). The number of eyes is not reduced (8+8, or in *Xenylla* 5+5). In the case of a reduced number of eyes (e.g. *Anurida tullbergi*, *Neanura tetrophthalma*, *Tetrodontophora bielanensis*), the species are always large and well pigmented. Many representatives of Poduromorpha and some Entomobryomorpha belong to this subclass.

Bb2. Lower hemiedaphobionts:

Like the previous subclass, these live in the uppermost soil horizons, especially in plant litter and the upper part of the humus horizon. They are smaller in size (0.7 to 1 mm long) in comparison to subclass Bb1. Their smaller size enables them to penetrate into deeper levels of the humus horizon. Their bodies are stout or a little rotund, the furca is well developed, but in some species it can be reduced or completely missing. Pigmentation is usually diffuse, or exceptionally strongly developed. The number of eyes is usually not reduced (8+8, or in *Xenylla* 5+5), but in some cases an eyes reduction could occur, too. Members of Poduromorpha and less numerous representatives of Entomobryomorpha belong to this subclass.

Bc. Euedaphobionts:

These live exclusively in soil or soil-like substrates, or inhabit nests of social insects or burrows of mammals, and caves. Small (0.25 to 0.7 mm), medium (0.7 to 1.2 mm) and large sized animals, body stout or slender; pigmentation is always strongly reduced (diffuse) or completely absent. The furca in some cases is well developed, otherwise reduced or completely absent. Members of almost all families of Collembola belong to the euedaphobionts. They inhabit diverse soil horizons and subhorizons from the soil surface down to deep mineral layers. They have developed strong morphological adaptation to the life in the soil. Because of their different degrees of adaptation to life in deeper soil horizons, the subgroup euedaphobionts is subdivided into three size classes and further into subclasses, depending on development (well developed) and size (missing or reduced) of the furca. Such a subclassification will serve very well for bioindication of soil conditions (aeration, connectivity of pore spaces, tunnels, large crevices, etc.). At least the smallest species of the small sized class of euedaphobionts without furca (subclass Bc3b) may live in poorly aerated and compacted soils with low fertility.

Bc1a. Large size with furca:

They inhabit predominantly the upper soil layers, but also loose, well aerated deeper soils, ant and termite nests, and caves, etc. They are more than 1 mm long, with well developed furca. Pigmentation is usually diffuse or completely absent (except for eyes). The number of eyes is strongly reduced (5+5 to 1+1) or eyes are missing. Species of the genera *Arrhopalites*, *Cyphoderus*, *Folsomia*, *Heteromurus*, *Isotomiella*, *Pseudosinella*, and others belong to this subclass.

Bc1b. Large size with reduced or missing furca:

These live in the same microhabitats as members of the subclass Bc1a, but may also penetrate deeper into the soil. They are common in litter and loose humus horizons and are longer than 1 mm, but with reduced or absent furca. Pigmentation is at most weakly developed, diffuse, and mostly completely missing. The number of eyes is strongly reduced (3+3 to 1+1), but mostly completely absent. Representatives of Poduromorpha are most typical of this subclass.

Bc2a. Medium size with furca:

They live in upper, as well as in deeper, soil horizons and are not restricted to loose soils. Their length of 0.7 to 1.2 mm enables them to penetrate into deeper mineral soil horizons, too. Pigmentation is almost completely absent, but sometimes it is diffuse, or restricted to eye spots. Eyes are mostly completely absent or strongly reduced in number (4+4 to 1+1). The furca is always present, but is usually short. Some species of the genera *Folsomia*,

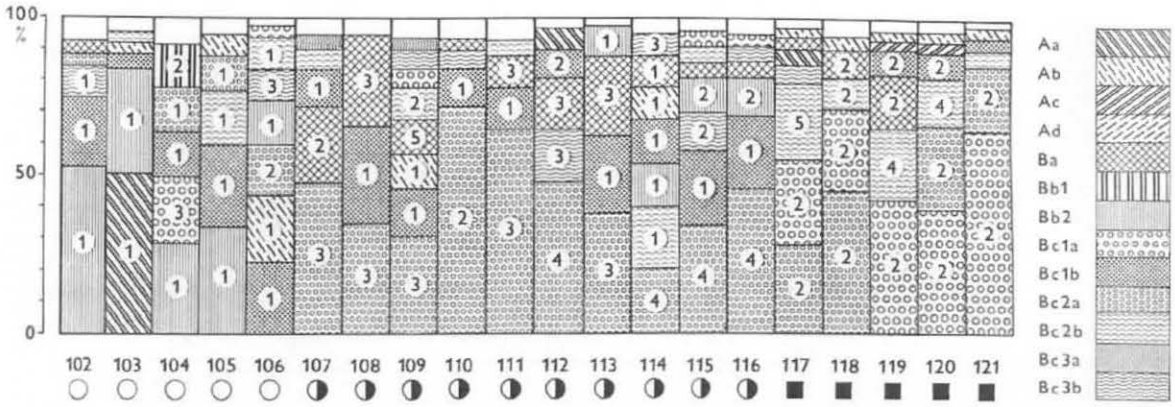

Fig. 2. Examples of the life form composition changes in four succession stages of xerothermic renzina soils in the Bohemian Karst (white circles – open plant community with protorendzina, black and white circles – xerothermic grassland, black squares – thermophilous oak wood). Numbers in white circles – species number in a certain life form unit.

Hemisotoma, *Proisotomodes*, *Parisotoma*, *Isotomodes*, *Oncopodura*, and others belong to this subclass.

Bc2b. Medium size with reduced or missing furca:

These live in upper or deeper soil horizons and are not restricted to loose soils; their length varies from 0.7 to 1.2 mm. They penetrate into deeper soil layers than the same size group of euedaphobionts bearing a well-developed furca (Bc2a). Pigmentation is usually completely absent. Eyes are missing or strongly reduced in number (1+1 to 3+3). The furca is missing or strongly reduced. Small species of Onychiuridae, larger Tullbergiinae and some other representatives of Poduromorpha belong to this subclass. Most species of Protura could be classified in this subclass, too.

Bc3a. Small size with furca:

These also live in deeper soil horizons with sufficiently large pore spaces. To this subclass belong the smallest Collembola, ranging from 0.25 to 0.7 mm long; pigmentation is absent or diffuse and weak. Eyes are absent, and the furca is well developed. Representatives of Neelipleona and some Poduromorpha belong to this subclass.

Bc3b. Small size with reduced or missing furca:

Like the previous subclass (Bc3a), they inhabit deeper soil horizons with very small pores where all of the previously mentioned subclasses of euedaphobionts cannot live. They are usually only 0.35 to 0.7 (0.8) mm long, elongated and slim. Pigmentation is absent or diffuse. The number of eyes is strongly reduced (1+1 or 2+2), and in most cases eyes are completely absent. The furca is missing or strongly reduced. Most Tullbergiinae species and some other minute Poduromorpha belong to this subclass. The smallest species of Protura (e.g. *Proturentomon*- species) could be classified in this subclass of life forms, too.

Collembola life form community structure

The life form structure of collembolan communities is an important ecological feature documenting the ecosystem development, including soil microstructure and porosity, as well as the microclimate changes during the year. The successive development of xerothermic rendzina soils was studied in Bohemian Karst near Prague (Kubíková and Rusek, 1976). The least advanced stage was represented by an open rocky grassland plant community *Seseli-Festucetum duriusculae* and a protorendzina soil type (Collembola samples 102-106 in Fig. 2). More advanced stages were represented by the xerothermic grassland plant communities *Carici-Festucetum sulcatae* (samples 107-111) and *Carici-Festucetum valesiacae* (samples 112-116) and a mull-like rendzina in both cases. The most advanced stage was a thermophilous oak wood *Lathyro (versicoloris)-Quercetum* (samples 117-121) with a moder rendzina. Samples 102,107,112 and 117 were collected in spring, 106, 111, 116 and 121 in February and the rest of them in summer. Fig. 2 shows the life form dominance structure and the species number (in the white circles) in individual samples and the changes during the seasons. The deepest seasonal changes in the collembolan life form structure show the least developed ecosystem with protorendzina during the summer period, while it is most stable in the climax thermophilous oak wood.

Acknowledgements

The work on this subject was supported by projects of the AS CR "Biodiversity and Function of Ecological Systems" (No. KSK 6005114) and "Impact of Climatic and Anthropogenic Factors on Biotic and Abiotic Environment" (No. KSK 3046108). I am much obliged to Dr. V.G. Marshall, Victoria, BC, Canada, for critical comments and English improvement of the manuscript.

References

Bockemühl, J., 1956. Die Apterygoten des Spitzbergs bei Tübingen, eine faunistisch-ökologische Untersuchung. Zool. Jahrb., Abt. Syst., 84: 113-194

Gisin, H., 1943. Ökologie und Lebensgemeinschaften der Collembolen im Schweizerischen Exkursionsgebiet Basels. Rev. Suisse Zool., 50: 131-224

Haarløv, N., 1960. Microarthropods from Danish soils. Ecology, phenology. Oikos, Supl., 3: 1-176

Hågvar, S., 1982. Collembola in Norwegian coniferous forest soils. II. Vertical distribution. Pedobiologia, 25: 383-401

Kampmann, T., 1987. Untersuchungen an Collembolenzönosen in Wäldern der Bundesrepublik Deutschlands. Dissertation, Rheinische Friedrich Wilhelm-Univ., Bonn, 179 pp.

Kubíková, J., Rusek, J., 1976. Development of xerothermic rendzinas. A study in ecology and soil microstructure. Rozpravy Československé akademie věd, Řada matematických a přírodních věd, 86, 6: 1-78, 16 Plts.

Rusek, J., 1964. K poznání společenstev Apterygot v západní části Tatranského národního parku. Sborník prác o TANAPe, 7: 218-226 (in Czech)

Rusek, J., 1989. Ecology of Collembola. In: Dallai, R. (ed.), 3rd Intern. Seminar on Apterygota, Siena, Italy, p.271-281

Rusek, J., 2001. Microhabitats of Collembola (Insecta: Entognatha) in beech and spruce forests and their influence on biodiversity. Eur. J. Soil Biol., 37: 237-244

Stebajeva, S.K., 1970. Ziznennyje formy nogochvostok (Collembola). Zool. Zurnal, 59: 1437-1454 (in Russian)

Appendix 1. Examples of Collembola life forms. The following examples of different species of Collembola should facilitate insertion of other species into the proper life form category.

A. ATMOBIONT GROUP

Aa – Macrophytobiont Subgroup

Bourletiella lutea (Lubbock, 1868)
Deuterosminthurus bicinctus (Koch, 1840)
Entomobrya nivalis (L., 1758)
Lepidocyrtus paradoxus Uzel, 1891
Sminthurus viridis L., 1758

Ab – Microphytobiont Subgroup

Anurophorus laricis Nicolet, 1842
Entomobrya corticalis (Nicolet, 1842)
Entomobrya handschini Stach, 1922
Entomobrya marginata (Tullberg, 1871)
Willowsia buski (Lubbock, 1869)

Ac – Xylobiont Subgroup

Deutonura phlegraea (Caroli, 1912)
Neanura muscorum (Templeton, 1835)

Ad – Neustont Subgroup

Podura aquatica L., 1758
Sminthurides aquaticus (Bourlet, 1841)
Hydroisotoma schaefferi (Krausbauer, 1898)

B. EDAPHOBIONT GROUP

Ba – Epigeont Subgroup

Allacma fusca (L., 1758)
Caprainea marginata (Schött, 1893)
Dicyrtomina minuta (L., 1767)
Isotoma anglicana Lubbock, 1862
Desoria fennica (Reuter, 1858)
Isotomurus palustris (Müller,1776)
Lepidocyrtus curvicolis Bourlet, 1839
Lepidocyrtus cyaneus Tullberg, 1871
Lipothrix lubbocki (Tullberg, 1872)
Orchesella cincta (L., 1758)
Pogonognathellus flavescens (Tullberg, 1871)
Pseudisotoma sensibilis(Tullberg, 1871)
Sminthurides parvulus (Krausbauer, 1898)
Sminthurinus aureus (Lubbock, 1862)
Spatulosminthurus flaviceps (Tullberg, 1871)
Sphaeridia pumilis (Krausbauer, 1898)
Tomocerus minor (Lubbock, 1862)

Bb – Hemiedaphobiont Subgroup

Bb1 – Upper hemiedaphobiont Subclass

Anurida tullbergi Schött, 1871
Ceratophysella armata (Nicolet, 1841)
Hypogastrura socialis (Uzel, 1891)
Superodontella lamellifera (Axelson, 1903)
Pachyotoma recta (Stach, 1930)
Pseudachorutella asigillata (Börner, 1901)
Tetracanthella arctica Cassagnau, 1959
Tetrodontophora bielanensis (Waga, 1842)
Xenylla brevicauda Tullberg, 1869

Bb2 – Lower hemiedaphobiont Subclass

Brachystomella parvula (Schäffer, 1896)
Folsomides pusillus (Schäffer, 1900)
Friesea claviseta Axelson, 1900
Proisotoma minuta (Tullberg, 1871)
Xenylla boerneri Axelson, 1905

Bc – Euedaphobiont Subgroup

Bc1 – Large size euedaphobiont Class

Bc1a – Large size euedaphobionts with furca Subclass

Arrhopalites terricola Gisin, 1958
Folsomia candida Willem, 1902
Heteromurus nitidus (Templeton, 1835)
Isotomiella minor (Schäffer, 1896)
Pseudosinella alba (Packard, 1873)
Pseudosinella decipiens Denis, 1924

Bc1b – Large size euedaphobionts with missing or reduced furca Subclass

Anurida granaria (Nicolet, 1847)
Onychiuroides granulosus (Stach, 1930)
Protaphorura armata (Tullberg, 1871)

Bc2 – Medium size euedaphobiont Class

Bc2a – medium size euedaphobionts with furca Subclass

Folsomia hrabei Rusek, 1984
Folsomia sensibilis Kseneman, 1936
Isotomodes productus (Axelson, 1906)
Oncopodura crassicornis Shoebotham, 1911
Parisotoma notabilis (Schäffer, 1896)
Proisotomodes bipunctatus (Axelson, 1903)

Bc2b – medium size euedaphobionts with missing or reduced furca Subclass

Anurida granulata Agrell, 1943
Metaphorura affinis (Börner, 1902)
Micraphorura absoloni (Börner, 1901)
Paratullbergia callipygos (Börner, 1903)
Stenaphorura quadrispina Börner, 1901

Bc3 – small size euedaphobiont Class

Bc3a – small size euedaphobionts with furca Subclass

Megalothorax minimus Willem, 1900
Neelides folsomi Caroli, 1912
Neelus minutus (Folsom, 1901)

Bc3b – small size euedaphobionts with missing or reduced furca Subclass

Anurida sensillata Gisin, 1953
Doutnacia xerophila Rusek, 1974
Jesenikia filiformis Rusek, 1997
Karlstejnia annae Rusek, 1974
Mesaphorura krausbaueri Börner, 1901
Micranurida pygmaea Börner, 1901
Pseudanurophorus binoculatus Kseneman, 1934
Wankeliella mediochaeta Rusek, 1975
Willemia anophthalma Börner, 1901